JOURNAL
OF THE
AMERICAN FOUNDRYMENS' ASSOCIATION.

VOL. 5. OCTOBER, 1898. NO. 28.

PROCEEDINGS OF THE WESTERN FOUNDRYMEN'S ASSOCIATION.

The annual outing meeting of the Western Foundrymen's Association was held on Wednesday, September 21, at Racine, Wis. A party of sixty left Chicago on the steamer City of Racine at 9 a. m. on that day, spending a delightful day on the waters on Lake Michigan, taking luncheon on the steamer, and arriving at Racine at 2 p. m. This party was met at the Goodrich Line dock at Racine by a delegation of Racine foundrymen and by a number of visitors from cities north of Racine, who had arrived at that place earlier in the day. The members of the Association and their friends were taken first to the plant of The J. I. Case Threshing Machine Co.

There they were met by the officers of the company, who showed them through the immense establishment, giving them opportunity to investigate the manner of making its products. This company employs over 800 hands, and has been running its works continuously throughout the whole of this year. During the summer months the plant was kept running until late at night, in order to turn out the extraordinarily large number of machines necessary to meet the requirements of the business for the present year. Usually the plant shuts down for repairs and stock-taking early in September, but the demand for its products was so large this year that it will be kept running until

some time in October. This company makes about 95 per cent. of the treadmill horse-powers manufactured in this country, and also turns out large numbers of threshing machines and traction engines. The shops have a floor space of over 40 acres, and a movement is at present on foot in the city of Racine, to vacate certain streets to give more land to the company for the enlargement of its works. The business has grown so large as to make an increase in the size of the plant imperative, and the present property holdings of the company are fully taken up with buildings, and cannot be enlarged without the vacation of the streets intersecting it.

Naturally, the first place of interest to the foundrymen was the foundry of the plant. This is contained in a substantial stone building 150 by 350 feet in size, and having an L of the same proportions. The building has an iron truss roof, making a single span, so that there are no posts in the floor. The arrangements for lighting and ventilation are excellent. Most of the bench work is done in a large room which is partitioned off from the main room for that purpose. Most of the castings are of small size, not averaging over ten pounds, and a considerable portion of the floor is laid out with small flasks laid in the floor as in a stove foundry. These flasks are all moved by hand, no cranes being employed. Larger castings for the traction engines are made in the L, and this portion of the plant is supplied with steam cranes and air hoists for handling the heavier work. The iron is supplied by two 72-inch cupolas located at the end of the foundry, convenient to both the main portion and the L. The charging is done by means of small iron cars, running on a narrow guage track in the foundry yard. When loaded with pig iron, coke, scrap, etc., the cars are run through weighing house, and are then taken to a vertical electrical hoist, which stops automatically at the charging platform. The cars, when emptied, are then returned over the same course. This arrangement necessitates carrying only a small amount of material at a time on the charging platform. About 30 tons of metal are melted daily in the foundry, the cupolas running alter-

nately. The blast is supplied by a Connersville Blower Co. cycloidal positive pressure blower, run by an electric motor. This has given excellent satisfaction, running with a saving of 30 per cent. in power over the ordinary fan previously employed. About 150 molders are now employed in the foundry, but as soon as the company secures the necessary land to make the proposed extensions the size of the foundry will be considerably increased, and a larger number of molders will be employed. An annex to the foundry contains the pattern shop, drafting room, etc., and is a four-story building covering 40 by 200 feet. A building for cleaning castings adjoins the foundry, and occupies a floor space of 150 by 200 feet.

The next place visited was the smith shop, which is a brick building 100 by 250 feet, with an L of the same size. In this shop tires are welded for traction engines, large bolts are made and a great deal of other forging is done requiring an extensive equipment of forge fires and hammers. The largest tires welded are 24 inches wide, of ½ inch stock.

From this shop the visitors were taken to the separator machine shop for threshers and attachments, belt room, seive department, paint grinding department, etc. In this machine shop is a multiple spindle drill boring up to 11 holes at a time in steel cylinder bars which are used in making threshing machine cylinders. The main wood shop, 150 by 680 feet, is four stories high, and contains an extensive equipment of woodworking machinery. The upper floors are used for setting up the different parts of separators and attachments. Its capacity is one complete separator every thirty minutes. Between the main shop and the machine shop is installed the main battery of boilers, which supply an 800 H. P. Corliss engine, generating power for this part of the plant. An electric station located here, with a capacity for generating 500 H. P., furnishes power for the foundry, lights the entire plant, and drives the elevators and shipping hoists. An additional power arrangement is used for furnishing compressed air, which is used in the foundry for air hoists and pneumatic tools. An increase in the compressed air plant is contemplated so as to enable that power to be used for other purposes.

The traction engine department turns out five complete traction engines every working day of ten hours. This plant occupies a building 280 by 625 feet, two stories high. The upper floor is used for supplies, brass goods, etc. The lower floor is furnished with the latest improved labor-saving machinery, to secure complete accuracy for every part made. A 150 H. P. Corliss engine furnishes power for this department. The weigher department has recently been added to the plant, using one floor of a building 350 by 450 feet, and is being enlarged considerably for next season's trade. An independent building, 250 by 300 feet, four stories high, is used for the horse power department. In addition to the buildings mentioned there are a store house, containing store rooms, through which all stock passes, which covers a complete block and is two stories high, and a two-story building, 100 by 250 feet, occupied by the store keeper of repairs.

The offices of the company are contained in a special building two stories high, and are necessarily comprehensive. On the upper story of the building are located a laboratory equipped with modern apparatus for testing thoroughly all forms of iron and steel, either cast or wrought, brass goods, paints, oils, lumber and in fact everything entering into the company's products. The company also maintains a printing plant, occupying a space of 20 by 75 feet, and this is kept going steadily turning out advertising literature for the concern.

Large warehouses are required for the storage of the machinery made by the company, as it is naturally of very bulky character, and the sale is confined to certain seasons. The main warehouse is 200 by 600 feet in size, with an L 200 by 450 feet, three stories high. Another warehouse is 150 by 275 feet, one story high. The old plant of the S. Freeman's Sons Co., located next to the Case plant, has just been leased for the storage of small parts, and the company is also making arrangements to erect additional store houses with capacity twice as large as their present houses, to be ready for the constantly increasing demand for its products. The company has a very large export trade,

making large shipments to South America, Russia and Roumania, and other foreign countries, every year.

THE BELLE CITY MALLEABLE IRON CO.

The next point of interest to the visitors was the plant of the Belle City Malleable Iron Co. The foundrymen were astonished to find out the rapid growth this business had made in the past year. It is well known that the manufacturers of mallealble castings have done a tremendous business in the past year, but very few realize the extent to which this business has grown. The Belle City plant gives positive evidence of the great enlargement of the trade. The plant has actually been quadrupled in size during the present year, and with the increased facilities the company has all it can do to keep up with the requirements of its trade. The plant has three air furnaces, all of which, however, are not used at one time. The output of the plant is upwards of 50 tons per day, all of it, or almost all, in very small pieces. The concern uses a number of molding machines made by the Adams Co., of Dubuque, Iowa, for work requiring large numbers of duplicates. Pittsburg coal is used in melting iron in the air furnaces. In annealing the castings, oil is used. The castings are packed with rolling mill scale, coke screenings, fire brick dust and clay in the cast iron pots, which are put in the annealing ovens. Two oil burners were placed at each end of the ovens last built, enabling the castings to be annealed in these in from 32 to 48 hours. The company has a well equipped blacksmith and forge shop, in which iron and steel is worked up for use in the manufacture of wagon and carriage hardware. The company manufactures as its own specialties wagon and carriage hardware and bicycle parts, and also does a heavy business in contract and jobbing work. One of the interesting castings shown to the visitors as a sample of the work done in the place was a malleable iron lamp for railroad use, of the conventional table lamp pattern and ornamental in appearance as well as exceptionally strong to withstand rough usage. The establishment is heated with hot air on the blower system, installed by Wm. Bayley & Sons Co., of Mil-

waukee. About 350 hands are employed, 155 molders being engaged on snap work alone.

THE BANQUET.

A banquet was prepared for the visitors at the Hotel Racine at 7 o'clock. After the courses had been served President G. H. Carver, acting as toastmaster, called the meeting to order, and introduced E. H. Walker, superintendent of the foundry department of the J. I. Case Threshing Machine Co. Mr. Walker delivered a hearty address of welcome to the foundrymen, and expressed the pleasure felt by himself and his company in having the meeting of the Association held at Racine and in showing the members through the works of the company. Mr. Carver replied, thanking the Racine foundrymen in the name of the Association, for the courtesies shown the visitors. Toasts were then in order, and the following were responded to by the gentlemen named: "Our Associate Members, the Supply Men," by C. A. Sercomb; "Pig Iron in Porto Rico," by E. L. Billingslea; "The Chicago Foundrymen," by W. A. Jones; "The Blast Furnace in Its Relation to Foundry Practice," by Capt. Irving M. Bean; "The Press, Its Relation to Foundry Practice," by George W. Cope; "Chemistry as Applied in the Foundry," by H. C. Loudenbeck; "The Plumbago Club in Cuba," by S. T. Johnston; "Transportation Interests," by A. W. Bair. Joseph Harrison, of the E. P. Allis Co., was called on, and made a capital address on showing courtesies to visiting foundrymen. B. T. Bacon was also called on, and made some general remarks on the subject of the foundry trade.

A vote of thanks was tendered to the pig iron and supply men of Chicago, who bore the expense of the trip, and another vote of thanks was entended to the J. I. Case T. M. Co., and the Belle City Malleable Iron Co., for the courtesies shown the visitors.

PROCEEDINGS OF THE PHILADELPHIA FOUNDRYMEN'S ASSOCIATION.

The eightieth meeting of the Foundrymen's Association was held at the Manufacturers' Club in Philadelphia on Wednesday, September 7, the president, P. D. Warner, occupying the chair. The report of the Executive Committee stated: "It would seem to us that there never was a time in the history of this association when the outlook for a good business was better than now. There seems to be no financial trouble, good crops are being gathered, and the war is over; therefore there appears to be nothing in view to block the wheels of trade. The whole country is in a good condition, and if we do not have at least two years of prosperity we shall be much mistaken. Almost all the foundries in this vicinity have had about as much to do as their capacities would allow, but prices have not been as high as they should be. It is altogether likely that prices of iron, coal and other materials will advance in the near future, and the advance will be legitimate, for the reason that our shops will be overcrowded with work. We are told that pig iron has already advanced from 15 cents to 25 cents per ton, and the price of castings must advance at least in proportion."

The Ingersoll-Sergeant Drill Company, Easton, Pa., were elected to membership in the association.

The treasurer, Josiah Thompson, reported the finances of the association to be in good shape, with a nice balance in hand.

Secretary Evans called the attention of the meeting to the fact that there were no papers before the meeting that evening, the proceedings having been announced to be of a social character and in part a celebration in honor of the victories won in the late war with Spain. He then introduced C. S. Bell, president of the National Foundrymen's Association, who addressed the meeting on the lessons brought out by the war and the improved prospects for trade in this country presented by new acquisitions of territory. In regard to the foundry trade he said: "I see a great improvement in the West. The foundries there are, as a general

thing, very busy and full of work. The only drawback is the low prices at which work is being taken, and these are beginning to regulate themselves largely. We can never expect to get the profits once to be made in the business, but by economy we may pull through. It is by practicing economy that the business will become regulated to our new conditions. When your foundry is full of work you do not bid much less than your neighbors. You do not want work unless you get a good profit. Heretofore, if there was a job to be let, the competition was very close and prices were ground down. Now, however, it is different. When a foundryman is approached with a job of work, if there is nothing in it he does not want it."

The usual call was made upon the members present for reports on the condition of trade in the various shops, and the reports showed that there was a fair amount of work in the foundries of this section, but there was room yet for a good deal of work before the capacities of foundries would be crowded. Some complaint was forthcoming in regard to prices, which showed no improvement whatever.

The secretary announced that the Executive Committee had purchased a stereopticon, and the same would be set up at all future meetings of the association for the use of members and others who desired to show slides of anything generally interesting to foundrymen.

The meeting closed with the following address from the president:

THE PRESIDENT'S ADDRESS.

Gentlemen: Congratulations upon the successful termination of the late war with Spain are in order at this the opening meeting after our summer adjournment. At the meeting in May, and before the knowledge of Dewey's splendid victory at Manila, I took occasion to say that when we came to reflect upon the relative strength and resources of Spain and our own country the war should be of short duration; that its effect upon business at first, in a general way, would be depressing, but that the result, upon its termination, would be a more perfect union of the American

people, the expenditure of large sums of money upon the navy, the establishment and maintenance of a merchant marine, a still larger and larger foreign trade, and the assurance of the fact that we were not only one of the greatest nations upon land, but also upon the seas; the restoration of complete confidence and conscious greatness of our people, and bring to them plenty and prosperity for years to come. I should have added to this: "And a larger standing army with which to hold our newly acquired territory and to more efficiently protect and preserve the peace and dignity of the whole country." I believe that a people who are willingly supporting a standing army of a million pensioners one-third of a century after the war of its occasion will not object to a largely increased army for our camps and forts. I firmly believe in all I said then, and am proud that so vast an amount of it has already been secured, so that I can well afford to stake the rest upon the future.

This is the time to form public sentiment, and this association should not be wanting in that direction. I refer to the spoils secured by our late victories upon land and sea, and mean to say, for myself, that I am not in favor of giving up any territory or advantages acquired by the war. We are entitled to Cuba and all the rest of the West Indian islands in possession of Spain prior to the war, and as to the Philippines, I believe they should also be held by this country, and I would not be willing to yield any portion of them unless under the greatest pressure. We are entitled to their acquisition as a result of the war, and if we were to yield them, to whom should it be? We are nearer to them than any other of the leading nations, and considering the position of our country and its sea coast on the Pacific, they ought to be in our possession.

It is a well-known fact that this country gained vastly with every accession of territory heretofore. I would refer to that of the Floridas, an accession from Spain; the purchase of Louisiana from the French; the acquisition of Texas and all that vast and invaluable territory of the Southwest as a result of the Mexican war. The purchase of Alaska was also of great importance,

and especially so at this time in view of the discovery of gold in that and adjacent territory. It will be so in the acquisition of the West Indian and of the Philippine islands. We are probably not in a condition at this time to realize the far-reaching and beneficial effects of these new acquisitions to this country.

Shakespeare says: "There is a tide in the affairs of men which, taken at the flood, leads on to fortune." It is just the same with nations. The tide has reached us, and if we take it at its flood it will lead us on to fortune, but if omitted, while it may not land us for the rest of our voyage in shallows or in miseries, it may cripple and curtail us to that extent that we otherwise might have attained.

TRANSACTIONS OF THE AMERICAN INSTITUTE OF MINING ENGINEERS.

Erwin S. Sperry read a paper on "The Influence of Bismuth on Brass, and Its Relation to Fire-cracks." Mr. Sperry presented a series of experiments, five in all, with mixtures of brass and bismuth, containing about 60 of copper, 40 of zinc, and 0.50 of bismuth in No. 1, reducing the proportion of bismuth each time till the last mixture contained only 0.02 of this factor.

The first four samples cracked under the process of rolling, and upon being annealed, showed latent fire-cracks, generally very numerous. There were evidences of segregation of the bismuth, which probably caused the cracking of the samples.

The sample containing only 0.02 of bismuth showed in the fracture, "no traces of crystallization, and compared favorably with that of brass free from bismuth or other injurious elements."

Mr. Sperry points out that while it is shown that any considerable proportion of bismuth will cause fire-cracks, yet it must not be supposed that all fire-cracks in brass castings are due thereto, as the amount of bismuth in copper generally is insignificant in quantity. The sample containing so much as 0.50 of bismuth could not be hot-forged; and even the sample having only 0.02 of bismuth did not behave as brass containing no bismuth. Finally the results of his experiments are thus collated:

1. Bismuth renders brass cold-short, and is similar in this respect to antimony.
2. Bismuth causes fire-cracks.
3. High brass for cold-rolling should not contain over 0.01 of bismuth.
4. Bismuth causes hot-shortness in brass.
5. Bismuth will cause latent fire-cracks in brass, probably by causing lines of inferior cohesion.

"Silicon and Cupola Problems," is the title of another paper read before this society by Bertrand S. Summers, of the Western Electric Co., of Chicago.

A considerable number of carefully conducted tests were made, from which it was evident that the element, silicon, does not play so important a part in cupola practice as has been generally supposed; and, indeed, it would hardly seem to have any appreciable effect on the iron. It had come to be a settled fact in the minds of foundrymen that silicon was the governing factor in cast iron; but this is inconsistent with Mr. Summers' results. Perhaps the most striking illustration of his conclusion is in the following analyses taken from two different heats, the irons being almost identical as to total carbon, but varying greatly in graphitic carbon and in silicon:

	1	2
Silicon	220	292
Graphite	292	277
Total carbon	344	341

There is nearly the same of total carbon in each, but in the second instance the silicon is 0.72 in excess, while the graphitic carbon is short by 0.15. According to the prevailing theory, the graphite ought to have been much greater in the latter instance than in the former, and no doubt would have been, if the invariable effect of silicon were to promote combination.

The above has reference to high-graphitic charcoal irons. He shows that "in coke iron mixtures the failure of silicon to increase the percentage of graphite is even more marked."

He furthermore adduces that the degree of heat determines the action of silicon upon the carbon, and indicates that in the blast furnace the heat is very much higher than can be produced in the cupola, and that here the heat is sufficient to cause the silicon to effectively act upon the carbon, while in the cupola the intensity of the heat is not sufficient therefor. His experiments lead him to the opinion that the total content of carbon is of much greater importance than that of silicon, and that the stronger the blast (within limits) the greater the percent of graphitic carbon, and the softer will be the casting product.

A REVIEW OF THE FOUNDRY LITERATURE OF THE MONTH.

AMERICAN MACHINIST.

SEPTEMBER 22ND.

This journal contains an article on "The Strength of Pulley Arms," by C. H. Benjamin.

The article is an exposition of the results of experiments carried through a period of two years, under Mr. Benjamin's direction, by senior students of the Case School of Applied Science. Twenty-four tests were made by applying strain to the pulleys as nearly as possible like that exerted by the belt in common use. Half the pulleys were of all cast iron, the other half being of the Medart pattern, having steel rims, and cast steel hub and arms. The pulleys were mounted on octagon shafts, fixed in housings set upon the testing machine. The pull, or strain, was divided between the two sides of the pulley in the ratio of two to one, this being approximately in agreement with actual practice.

The arms broke invariably on the side of greater strain, thus proving that the rim does not evenly distribute the strain upon all the arms. Also, in nearly all cases, the arm broke first at the end next the hub, as might be expected, for the arm next the rim is sufficiently rigid and strong to cause the rim to bend a little before the arm will break. The arms of the cast iron pulleys usually separated a little and remained apart after fracture, showing a condition of initial stress, from shrinkage. The fact that most of the arms of the cast iron pulleys broke at both ends, shows that the proportions of the arm are approximately correct (this refers, of course, to the modern straight arm pulley).

In the Medart pulleys all the arms broke at the hub only, as the steel rim proved too weak to cause rupture at the outer end. It was also apparent that the arm of the steel pulley might have considerably more taper without impairing its ultimate strength, and that an increase in width of rims on both kinds of pulleys would add to their strength by more evenly dividing the strain

among the arms. Six tables are presented, recording the details of the experiments.

SEPTEMBER 29TH.

"Pattern Work That Helps the Molder," by John M. Richardson.

One of the most provoking, as well as costly things in the foundry is a sticking dowel pin. Mr. Richardson treats the subject in a manner that shows he has had experience with the "pesky thing." He says the parallel portion should be very short, from, perhaps, a sixteenth to an eighth of an inch, and the remainder should taper rapidly. Metal pins and sockets are greatly superior to wood—in fact, wood is really unfit, because of its quality of swelling and shrinking. The patternmaker is very careless in fitting dowels, and so causes much trouble and loss of time in the foundry.

"When loose pieces are attached to a pattern by a dovetail, they should drop freely into their places by their own weight. The edges should be tapered, and the thickness also; for, unless the piece taper in all dimensions, it will be very apt to stick."

The marking of patterns should be more thorough than is the general practice. Each removeable piece should have its distinctive mark to correspond with one on the body of the pattern at its proper place. The body of the pattern should be black, the core prints yellow, and the back of every loose piece should be red, as also the spot where it fits on the body of pattern.

Where possible, cores and prints should be so constructed as to prevent possibility of wrong setting. Core-boxes and loose pieces should be numbered the same as the pattern, and their collective number painted in color upon the body of the pattern, as a guide to the molder.

An unsigned article comments on devices for the emancipation of the molder. The heavy, fatiguing work should be done by mechanical devices. Insufficient thought is given to this feature of founding. Even the breaking of pig iron is generally done by manual labor, whereas a mechanical device for this pur-

pose is a very simple affair. While the problem of effective and economical helps may be difficult, yet we believe it capable of a happy solution. The molder of the future will have easier work, as evidenced by past and prospective improvement in foundry appliances.

IRON AGE.

SEPTEMBER 1ST.

An illustrated article describing very complete and extensive electrical devices in the Reading Car Wheel Works appears in this number. A review, without the illustrations, would be very unsatisfactory; suffice it to say that the plant gives excellent service, and the owners claim for it superiority over every other means of power in the foundry.

The issue of September 29th gives the schedule of specifications for castings adopted by the J. I. Case Manufacturing Co., of Racine, Wis. These specifications contain concisely stated and very important information upon the metallurgy of cast iron. They give the proportions of the various chemical constituents desirable in mixtures of three different grades, to be used in the manufacture of various qualities of castings for special uses, and tell, in a perspicuous style, the effects of the various metalloids.

AMERICAN MANUFACTURER.

SEPTEMBER 16TH.

Fer Blanc discusses here the state of chilled roll manufacture and use, setting forth the shortcomings of the roll as now produced, and the need of improvement. The metal of which the roll is made, he says, is very brittle, breaking at a tensile strain of from 20,000 to 30,000 pounds to the square inch. He also calls attention to the fact that a high tensile strength is no warrant against brittleness. The question of initial strain is of minor importance, since it is probable that little exists. But the local, irregular and interrupted heat communicated during the operation of rolling hot plate is the probable cause of breakage. The factor of safety varies from 15 to 20, normal, down to

1 under conditions prevalent in operation. A knowledge of the distribution of the heat in actual use, and of the physical characteristics of the roll as it will be affected by the heat, is essential in order to improvement. Little is now known in this direction. It is suggested that co-operation between the maker and user would be highly useful in order to overcoming the difficulties involved.

THE FOUNDRY.

SEPTEMBER.

"An Oven for Dry Sand Molds" is described in this number by I. B. Thomas. This is a very elaborate paper, and is of such character that any attempt to give an adequate idea of the oven by a brief review would be futile. The oven is illustrated in plan, elevation and detail by upward of twenty figures. The aim accomplished is to economize space and fuel, and to control and evenly distribute the heat. The oven is double in design, and the heat is introduced through a flue, underground, and up through the partition wall, and passing into the ovens from openings controlled by dampers about three feet from the floor, whence the heated gases, mechanically mixed with cold air, spread along the ceiling and pass down over the floors and out through a flue at the bottom to the stack.

Referring to the even distribution of heat, it is stated that a pine board laid on the floor may be ignited, and that so perfect is the draught under control that all parts of the mold or core can be perfectly and rapidly dried without burning at any point.

A good idea of the substantial character of this oven is indicated by Mr. Thomas' description of the construction of the car tracks. We quote: "The track is a much neglected feature of most ovens and consequently a continuous source of annoyance and often serious trouble, owing to depressions, causing drops in the molds when green, by the jarring, or else a core truck goes off the track, due to the rails spreading. Tracks made by grooves in cast plates are very unsatisfactory, as they will warp. We laid a brick wall or foundation 13 inches wide and 18 inches deep under each rail, and on these fastened cast iron

coping plates about 12 feet 6 inches long, and securely fastened with seven-eighth inch anchor bolts down through holes in the four bosses" (see cut). Other devices were also employed to secure stability and permanence.

Loss of heat by radiation is prevented by using double walls with a four-inch air space between. The doors, which form about one-fifth of the radiating surface of the external walls, are lined with sheet asbestos one-half inch thick.

Oil was tried as fuel with unsatisfactory results as to cost as compared with coke, which latter is easily made to give uniform temperature; and, altogether, the oven as now operated, gives perfect satisfaction.

"The Evolution of the Pulley Arm," by R. D. Moore, treats of the passage from the curved to the straight arm, and affirms the superiority of the latter. This article also is illustrated by cuts showing various styles of pulley arms, assisting to exhibit the character of initial strains, and the cause of breakage. It is pointed out that the shrinkage strain on the straight arm is entirely a tensile strain, while that on the curved arm a combination of tensile and compression strains, amounting in effect to a transverse strain, which causes the arm to break the more readily. The thicker the rim, within limits, the less the initial strain. Pouring in the rim also helps to uniform cooling.

In this article Mr. Moore also tells of "additions to a hub to compensate for the weakening effect of a set-screw hole, or a key-way." He says: "Set the dividers to span the thickness of the hub, allowing ¼ inch extra to compensate for the weakening effect of the square corner of the key, the point at which a break will always start. Then, setting one leg of dividers at the corner of key-way, describe an arc from the hub to the arm, which will give the required dimensions."

Samuel Park writes on "The Use of Low Grade Irons as a Substitute for Scrap." He believes that, because of the variable quality of scrap, a low-grade pig iron may be used instead with greater assurance of uniform results.

Thomas D. West advocates the centering of responsibility

for founding results in the foundry foreman. He shows the results of conflict of authority, and the disastrous uncertainty of personal responsibility where authority is divided. The foundryman ought to fortify himself with full knowledge of matallurgy of cast iron, and in every way to educate himself up to the standard that will make him complete master of his business. Lacking in these qualifications, he is unfit for his position. He cites as an example of probable results, under division of authority, the entrance of the manager into the foundry some morning to find the shop filled with bad castings, the fault for which the foreman would lay to the chemist or metallurgist, while the latter would as strongly blame the former. Qualification for responsibility in foundry management consists of "knowledge of what iron analyses and the physical results such can and will give when remelted."

Mr. West strongly deprecates any attempt to shirk any part of responsibility because of increased demands incident to development of the science of founding, and urges greater assiduity on the part of the foreman to keep pace with all advance in his trade.

THE TRADESMAN.

SEPTEMBER 1ST.

Mr. Putnam says: "I have to confess that my views have, within the past year, undergone a decided change with regard to the effect of sand on the iron that is being melted in the cupola. The natural supposition is that the coat of sand on the gates and the rejected castings, and also on the pig iron, would retard the melting." He had always tumbled the gates, but latterly, for want of mill capacity, he was compelled to melt them without this, and, to his surprise, there was no retardation of the melting nor other adverse result, but on the contrary, the adhering sand obviated the need of using other flux.

He further says: "It may be that some kinds of sand are better than others for this purpose, but the practice is followed in widely separate parts of the country with perfect success; which would seem to indicate that almost any kind of molding

sand that clings to the casting will operate as a good flux, and, in view of my own experience, I do not hesitate to advise foundrymen to try the plan."

Writing of the foundry roof, he says: The floor of the foundry should be as clear as possible of permanent obstructions. * * * A post takes up too much room, and for these reasons a foundry generally has a truss roof. One does not appreciate how tremendously heavy truss roof is until he sees one that is too weak. It is better to build at additional cost than to take any risk in this direction.

As to the covering for the roof: There will probably be criticism of any kind that may be suggested. Slate makes a good roof, but a heavy hail-storm will smash it. The same is true of the asbestos, or the tin roof. Iron is totally unfit, as the peculiar conditions cause it to rapidly rust away. The paper covering, tarred and graveled, lasts a long time, is cheap at the outset, when damaged is easily repaired, and, he believes, is the most economical.

Speaking of room in the foundry, he cites a case where small iron flasks are much used, and, after molding up, they are stacked five or six high, thus getting a great amount of work in very small space.

With regard to the location of the "feeding head," Mr. Putnam says there is no reason why it may not be set within a half-inch of the pattern. This will render a very small connecting gate effective, and will reduce the need of chipping to the minimum.

In the issue of September 15th, he advocates the careful selection of molding sand, to suit the work in hand. Skill in molding cannot economically make up for unsuitable sand. The foundrymen who stand at the head in their business realize this, and act accordingly. The fact that many founders fail to equal their competitors in getting a good face on their castings is attributed to their disregard of this matter.

IRON MOLDERS' JOURNAL.

SEPTEMBER.

"Ramming and Venting," by Thomas A. Haigh.

Summarizing Mr. Haigh's article, he says, in substance, that intelligent use of the rammer and the vent wire will save a great deal of unnecessary work, and prevent much loss of castings. The pattern should be well studied before the work of molding begins, in order to determine the plan of ramming and venting. The sand far removed from the pattern should be, comparatively, hard-rammed, and the rammer should never approach nearer than within two inches of the pattern. Vent should be plentiful at inclosed places, and the wire ought not to come into contact with the pattern; otherwise the iron will run into and stop the vent, thus defeating the object. In difficult places, a train of cinder leading to the outside is very effective. Cinder beds of medium fine coke are best under large patterns, the bed to be covered with hay or straw, and pipes, one or more, should lead from the cinder bed to the outside. The sand covering the bed should be from 4 to 6 inches deep. The habit of careless venting leads often to ludicrous results, some molders jabbing the vent wire into a cope that really needs no venting, and touching the pattern at each stroke, the resultant casting exhibiting a forest of spikes on the top surface that indicates a thoughtless workman.

Jno. A. Macaulay writes on "Melting, Mixing and Casting of Brass."

Lake Superior refined copper is admittedly the best for casting. The metal should not be brought to too high a heat, or it will be spoiled for casting purposes, being thus rendered very brittle. The addition of tin will, in some measure, expel the gases and promote homogeneity, but will not entirely prevent the formation of holes. A better way is to stir with a hardwood pole till a sample, cooled, will show but a slight shrink depression on the top surface. Now raise the temperature, and continue stirring, till a sample, cooled, will show a level surface. Do not prolong the stirring beyond this, or the good effect

will be nullified. Now add a liberal supply of powdered charcoal, and, for a copper casting, pour at once. If tin is to be added, plunge it in and stir well and pour. The charcoal prevents oxidation. So Soon as sufficiently solid, plunge the casting in water, for quick cooling, in order to prevent segregation. Rapid cooling materially increases density, and enables the casting to stand much greater steam pressure. Gates cut at heavy points will cause honeycomb, and therefore should be cut at light or thin places. High feeding-heads are also very serviceable.

In brass, the zinc should be melted first and the copper added. If tin is to enter the mixture, add it after the copper. The reason for melting the zinc first is because that, at its fusing temperature, it will melt nearly 4 per cent. of its weight of copper, thus reducing the required temperature for copper alone by about one-half, and saving the waste of 6 per cent. of the zinc, which would be otherwise burned away. No refining is necessary in this alloy. Pour as soon as the copper is melted.